



III. Dental factors

The third major factor affecting the development of the occlusion of the teeth is the relationship between the size of the dentition and the size of the jaws which have to accommodate the teeth. Ideally, there should be adequate space for the teeth to erupt into the mouth without crowding or overlap; slight spacing is usually accepted as satisfactory.

In the primary dentition, actual overlapping of the teeth is unusual, and a disproportion between jaw size and tooth size is usually seen as a lack of spacing rather than as actual crowding.



Crowding affects approximately 60% of Caucasians. Both jaw size and tooth size are mainly genetically determined and appear to be reducing; however, environmental factors, for example premature deciduous tooth loss, can increase crowding. In evolutionary terms both jaw size and tooth size appear to be reducing. However, crowding is much more prevalent in modern populations than it was in prehistoric times. This may be due to the introduction of a less abrasive diet, so that less interproximal tooth wear occurs during the life time of an individual. Also, a change from a rural to an urban life-style can also apparently lead to an increase in crowding after about two generations.

Considering the amount of space deficiency, crowding is divided into:

- Mild crowding (<4mm)
- Moderate crowding (4-8mm)
- Severe crowding (>8mm)



Considering its etiology, crowding is divided into:

- Primary crowding (hereditary): crowding is determined genetically and is caused by disproportionately sized teeth and jaws. The malalignment of the anterior teeth is characteristic of this type of crowding.



- Secondary crowding: it is an acquired anomaly caused by mesial drift of the posterior teeth after premature loss of deciduous teeth in the lateral segments.

- Tertiary crowding:
occurs between primarily of the lower anterior teeth. It may be attributed to:

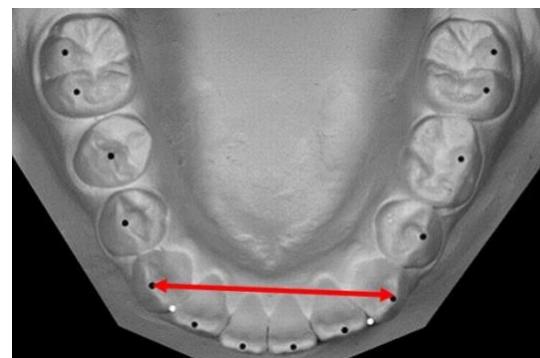


the ages of 18 and 20 lower anterior teeth. It may

- † mesial teeth owing to forces from the erupting third molars. The third molar has a weak association with late lower incisor crowding. Furthermore, this crowding can still occur in patients with congenitally absent third molars. Therefore, prophylactic removal of lower third molars to prevent lower labial segment crowding cannot be justified.

- † uprightening of the lower incisors as a result of forward growth of the mandible when maxillary growth has slowed.
- † soft tissue pressures being stronger from the lips and cheeks than from the tongue.

- † reduction in lower intercanine width: In most individuals intercanine width increases up to around 12 to 13 years of age, and this is followed by a very gradual diminution throughout adult life. The rate of decrease is most noticeable during the mid to late teens.



Disproportions in dentition size and jaw size do not always manifest as dental arch crowding. The form and size of the dental arch is important in governing the space



available for the teeth, and, the size of the dental arch may not be the same as the size of the arch of the basal bone of the jaw. Skeletal relationship and muscular factors can produce a dental arch which is larger or smaller than the arch of the basal bone, thus reducing or increasing the effects of excessive dentition size. Therefore, in considering these effects, it is more realistic to consider dentition size in relation to dental arch size, rather than to jaw size.

The effects of excessive dentition size

1. Overlapping and displacement of teeth

Teeth erupting into the arch tend to become displaced by teeth already in the arch. This particularly affects the last teeth to erupt in any group, i.e. the lateral incisors, second premolars, canines and third molars. In the incisor region the teeth tend to overlap and in the buccal segments the teeth tend to be displaced out of the arch. These conditions interfere with functional and artificial cleansing of the teeth.

2. Impaction of teeth

Impaction of teeth occurs when eruption is completely blocked by other teeth due to crowding. Again, it tends to affect the last teeth to erupt in each segment. The conditions in which teeth will become impacted rather than be diverted to erupt in aberrant positions are not understood, though the original position of the erupting tooth is probably important. **3. Space closure after extractions**

In the primary dentition, spontaneous space closure after extraction of teeth occurs less in the incisor region than in the molar region, more in the upper arch than in the lower, and continues up to 28 months after the extractions, but in the permanent dentition space closure proceeded most rapidly for the first 3 months, slowed a little up to 9 months, and then slowed considerably, with little space closure thereafter. The most important factor in governing the amount and rate of space closure is the degree of crowding of the dental arch.

Space closure after extractions in a crowded or potentially crowded dental arch occurs from both sides of the extraction space. Unless there is some physical barrier, the mesial movement usually exceeds the distal movement, perhaps by a factor of two to one.

The effects of early loss of primary teeth

The presence of the primary dentition is essential for normal growth of the jaws, for normal function and eventually for normal position and occlusion of the permanent teeth; and therefore, the premature loss of a primary tooth is to be avoided if at all possible. The effects of the premature loss of primary teeth include:



1. Effects on function and oral health

As far as oral health is concerned, the immediate effects of loss of infected primary teeth may be beneficial, removing stagnation areas and clearing oral sepsis. It has also been claimed that the loss of certain primary teeth, particularly the first molars, reduces the incidence of dental caries in the remaining teeth. There are, however, other methods of dealing with oral sepsis and of preventing dental caries without the loss of teeth.

Early loss of primary teeth may affect masticatory function, but, with the modern diet, the effects are likely to be small unless most or all of the teeth are lost. There may be slight effects on speech following loss of anterior primary teeth, but these are likely to be transient.

2. Over-eruption of opposing teeth

When a tooth is lost from the dental arch, excessive eruption of the opposing tooth, or excessive vertical dento-alveolar development, frequently occurs. This can be seen following loss of primary teeth, but on the whole this effect is transient. The eventual eruption of the successional teeth, together with continued alveolar growth, usually result in the establishment of the correct occlusal plane, provided the successional teeth meet in occlusion. 3.

Psychological effects on child and parent

Undoubtedly, the loss of anterior primary teeth alters the appearance of the child, which in some cases may produce undesirable psychological effects. After the age of 6 years most children and parents accept the natural loss of anterior primary teeth, but when these teeth are lost at an earlier age some parents, though not usually the children, are concerned by the appearance of the remaining dentition.



4. Effects on the position of permanent teeth

As far as the occlusion and position of the teeth is concerned, the most important result of premature loss of primary teeth is space closure, but this does not mean that premature loss is necessarily a disadvantage to the ensuing occlusion. The movement of teeth which will occur in potentially crowded jaws may even prove advantageous, by localizing the crowding to one part of the dental arch instead of allowing it to be spread around the arch.

The following factors affect whether premature loss of primary teeth may have adverse effect or no adverse effect on the position of the permanent teeth:

- (a) When there is ample space in the dental arch to accommodate all the successional teeth, little or no space will be lost by spontaneous movement



following loss of primary teeth, and no crowding of the permanent teeth is likely to occur.

- (b) *When there is just enough space for the successional teeth to erupt without crowding* the loss of even a small amount of space by movement of teeth into an extraction space will result in crowding of the permanent teeth.
- (c) *When there is slight crowding potential in the dental arch for the successional teeth*, movement of adjacent teeth partially closes the extraction space and increases the crowding potential, usually in the buccal region. If subsequent extraction of permanent teeth is planned, more space than is necessary to relieve the crowding is generated and the crowding is readily corrected.
- (d) *When there is severe crowding potential in the dental arch for the successional teeth* the eventual removal of a permanent tooth from each side of the dental arch may barely provide sufficient space for the remaining teeth. In such circumstances the premature loss of primary teeth can be expected to result in marked movement of teeth into the extraction space aggravating the crowding potential.

The effects of asymmetric loss of primary teeth

In a crowded arch, if the loss of primary teeth occurs only on one side of the arch the resultant distal movement of teeth anterior to the extraction space can lead to an asymmetry of the dental arch, with deviation of the centre, which can be difficult to treat. Therefore, in a crowded arch it is best to plan for lateral symmetry of extraction of primary teeth if any primary teeth have to be lost.



References:

- Foster TD. (1990): A textbook of orthodontics. 3rd ed. Blackwell Scientific Publications.
- Graber LW, Vig KWL, Huang GJ, Fleming PS. (2023): Orthodontics: current principles and techniques. 7th ed. Elsevier Health Science.
- Littlewood SJ, Mitchell L. (2019): An introduction to orthodontics. 5th ed. Oxford University Press.
- Proffit WR, Fields HW, Larson B, Sarver DM. (2023). Contemporary orthodontics 7th ed. Elsevier.
- Phulari BS. (2011): Orthodontics: principles and practice: JP Medical Ltd.



Singh G. (2015): Textbook of orthodontics. 3rd ed. JP Medical Ltd.